

CLAIMS

What is claimed is:

1. A limited play optically-readable medium comprising:
5 a substrate;

a reflective layer coupled to said substrate layer;

wherein said substrate comprises one or more layers through which a reading beam of an optically readable medium reading device passes before impinging on the reflective layer; and
10 at least one cholesteric liquid crystal material in the optical path of the reading beam, wherein said at least one cholesteric liquid crystal material substantially interferes with light at a first wavelength.
2. The limited play optically-readable medium according to claim 1, further comprising a wavelength shifting material in communication with said cholesteric
15 liquid crystal material, said shifting material shifts said first wavelength at which said least one cholesteric liquid crystal substantially interferes with light to a second wavelength.
3. The limited play optically-readable medium according to claim 2, wherein said wavelength shifting material is a volatile material.
- 20 4. The limited play optically-readable medium according to claim 2, wherein said wavelength shifting material is an oxidizable chiral dopant.

5. The limited play optically-readable medium according to claim 2, wherein said at least one cholesteric liquid crystal material shifts from said second wavelength to said first wavelength in response to a predetermined stimulus.
6. The limited play optically-readable medium according to claim 5, wherein said
5 predetermined stimulus comprises at least one of evaporation or sublimation of said shifting material.
7. The limited play optically-readable medium according to claim 5, wherein said predetermined stimulus comprises at least one of oxygen, humidity, photochemical energy, thermal energy, or combinations thereof.
- 10 8. The limited play optically-readable medium according to claim 1, further comprising a first cholesteric liquid crystal material and a second cholesteric liquid crystal material, said first cholesteric liquid crystal material substantially interferes with left-handed circularly polarized light of a predetermined wavelength and said second cholesteric liquid crystal material substantially interferes with right handed
15 circularly polarized light of a predetermined wavelength.
9. A limited play optically-readable medium comprising:
- a substrate;
 - a bonding layer coupled to said substrate layer;
 - a reflective layer coupled to said bonding layer; and
- 20 at least one cholesteric liquid crystal material included in said bonding layer, wherein said at least one cholesteric liquid crystal material substantially interferes with light at a first wavelength.

10. The limited play optically-readable medium according to claim 9, further comprising a wavelength shifting material in communication with said cholesteric liquid crystal material, said shifting material shifts said first wavelength at which said least one cholesteric liquid crystal substantially interferes with light to a second
5 wavelength.

11. The limited play optically-readable medium according to claim 10, wherein said wavelegth shifting material is a volatile material.

12. The limited play optically-readable medium according to claim 10, wherein said wavelength shifting material is an oxidizable chiral dopant.

10 13. The limited play optically-readable medium according to claim 10, wherein said at least one cholesteric liquid crystal material shifts from said second wavelength to said first wavelength in response to a predetermined stimulus.

14. The limited play optically-readable medium according to claim 13, wherein said predetermined stimulus comprises at least one of evaporation or sublimation of
15 said shifting material.

15. The limited play optically-readable medium according to claim 13, wherein said predetermined stimulus comprises at least one of oxygen, humidity, photochemical energy, thermal energy, or combinations thereof.

16. The limited play optically-readable medium according to claim 10, further
20 comprising a first cholesteric liquid crystal material and a second cholesteric liquid crystal material, said first cholesteric liquid crystal material substantially interferes with left-handed circularly polarized light of a predefined wavelength and said second cholesteric liquid crystal material substantailly interferes with right handed circularly poloarized light if a predefined wavelength.

17. A method of making a limited play optically-readable medium comprising:

encoding at least one substrate layer with optically readable content;

coupling at least one reflective layer to said at least one substrate layer,

wherein said at least one substrate layer comprises one or more layers through which a
5 reading beam of an optically readable medium reading device passes before impinging
on the reflective layer;

disposing at least one cholesteric liquid crystal material in the optical path of
the reading beam, wherein said at least one cholesteric liquid crystal material
substantially interferes with light at a first wavelength; and

10 disposing a wavelength shifting material in communication with said
cholesteric liquid crystal material, said wavelength shifting material shifts said first
wavelength at which said least one cholesteric liquid crystal substantially interferes
with light to a second wavelength.

18. A limited play optically-readable medium comprising:

15 at least one substrate layer, wherein said at least one substrate layer comprises
a bounded surface and an unbounded surface;

at least one reflective layer opposite said bounded surface of said at least one
substrate layer; and

at least one cholesteric liquid crystal material coated on the unbounded surface
20 of said at least one substrate layer, wherein said at least one cholesteric liquid crystal
material substantially interferes with light at a first wavelength.

19. The limited play optically-readable medium according to claim 18, further
comprising a wavelength shifting material in communication with said cholesteric

liquid crystal material, said shifting material shifts said first wavelength at which said least one cholesteric liquid crystal substantially interferes with light to a second wavelength.

20. The limited play optically-readable medium according to claim 19, wherein
5 said wavelength shifting material is a volatile material.

21. The limited play optically-readable medium according to claim 19, wherein said wavelength shifting material is an oxidizable chiral dopant.

22. The limited play optically-readable medium according to claim 19, wherein said at least one cholesteric liquid crystal material shifts from said second wavelength
10 to said first wavelength in response to a predetermined stimulus.

23. The limited play optically-readable medium according to claim 22, wherein said predetermined stimulus comprises at least one of evaporation or sublimation of said wavelength shifting material.

24. The limited play optically-readable medium according to claim 22, wherein
15 said predetermined stimulus comprises at least one of oxygen, humidity, photochemical energy, thermal energy, or combinations thereof.

25. The limited play optically-readable medium according to claim 19, further comprising a first cholesteric liquid crystal material and a second cholesteric liquid crystal material, said first cholesteric liquid crystal material substantially interferes
20 with left-handed circularly polarized light and said second cholesteric liquid crystal material substantially interferes with right handed circularly polarized light.

26. A data storage device, comprising:

a first substrate and a second substrate, wherein at least the first substrate has defined thereon a plurality of pits and lands covered by a reflective material;

a bonding layer between the first and second substrates;

a coating between at least one of the surfaces of the first and the second substrates and

5 the bonding layer wherein the coating includes a cholesteric liquid crystal material, said cholesteric liquid crystal material substantially interferes light at a first wavelength.

27. The limited play optically-readable medium according to claim 26, further comprising a wavelength shifting material in communication with said cholesteric
10 liquid crystal material, said wavelength shifting material shifts said first wavelength at which said least one cholesteric liquid crystal substantially interferes with light to a second wavelength.

28. The limited play optically-readable medium according to claim 27, wherein said at least one cholesteric liquid crystal material shifts from said second wavelength
15 to said first wavelength in response to a predetermined stimulus.

29. A method for limiting the readability of an optically-readable medium, said method comprising:

selecting a cholesteric liquid crystal material that substantially interferes with light of a predetermined wavelength, said cholesteric liquid crystal material is selected
20 to substantially interfere with light of a wavelength equal to a wavelength used by the optically-readable medium reading device to read the optically-readable medium;

selecting a wavelength shifting material, wherein said wavelength shifting material shifts the interference wavelength of said cholesteric liquid crystal material;

disposing said cholesteric liquid crystal material in communication with the optically-readable medium in the optical path of the optically-readable medium reading device; and

disposing said wavelength shifting material in communication with said
5 cholesteric liquid crystal material.

30. The limited play optically-readable medium according to claim 29, wherein said cholesteric liquid crystal material shifts from said second wavelength to said first wavelength in response to a predetermined stimulus.